





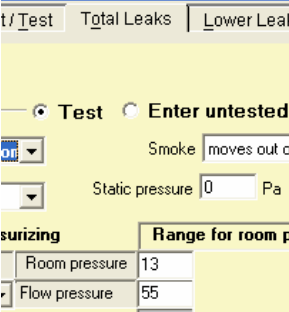




# 2000 Fire Door-Fan Manual

			
<p>Single Blower Panel Set Up</p>	<p>with Model N digital console</p>	<p>OR, Model L digital control panel</p>	<p>OR, Model E analog gauge clip</p>
			
<p>Large room testing with 2 Blowers</p>	<p>Or, E43 Aluminum Frame Set Up</p>	<p>Leak check at + 15Pa Room pressure</p>	<p>Smoke test &amp; measure static pressure</p>
			
<p>Range Selection</p>	<p>Room and Flow Pressure Readings</p>	<p>Windy test conditions</p>	<p>Mixing or NO mixing?</p>



What to do if room fails.



Lower leak tests using:  
Flex-duct ceiling  
neutralization



Lower leak tests using:  
Plastic-on-Ceiling  
procedure

Change to Test Label	Estimated leakage (sq. ft.)	% of full speed	Speed corrected (sq. ft.)	Adjusted audit (sq. ft.)
<b>Upper leaks</b>				
inlet to ceiling panel				
upper side penetrations				
downward duct openings				
upper open conduits				
other				
				<b>Total upper leaks</b>
<b>Lower leaks</b>				
inlet to lower side wall				
lower side penetrations				
lower open conduits				
downward duct openings				
door leaks				
window leaks				
sub-slab leaks				
other				
				<b>Total lower leaks</b>
<b>Lower Leaks are</b>		<b>Total upper and lower (sq. ft.)</b>		<b>0.00</b>
		<b>Adjustment factor</b>		
<b>% of Total Leaks</b>		<b>Measured leakage (sq. ft.)</b>		<b>0.00</b>
<b>Calculate</b>		<b>Print Form</b>		<b>Return to Lower Leakage screen</b>

Run from CA2001  
Lower leak Estimates  
using: Leak audit



Field Calibration



Tall doorways



Sub-floor Only tests using  
Floor neutralization  
procedure



Packing up and moving  
equipment



Large building Testing  
...rent additional  
equipment if needed



Recalibration of  
Retrotec Infiltrator



Troubleshooting and  
repair



## Single Blower Panel Set Up



Select a doorway where the air will be blown into the largest space so the air can find its way back to the leak. Set the panel bag close to the door.



Open panel bag and remove the Blower Panel with the 22-inch hole in it.



Open Blower Panel and position back edge against the doorstop.



Pull top strap tight and secure strap in the nylon cleat. Press the loop against the Velcro to keep strap ends neat.



Cinch lower strap tight and secure strap in cleat.



The small fill-in sheet is positioned first in the groove. It fills in the gap for doors up to 36"



Smooth down the fill-in sheet from top to bottom



Place the large X-Panel in the top of the doorway.



Cinch and lock the pull strap to secure the panel.



Place blower case next to the doorway.



Hook the bottom foot on the blower through the hole in the center of the panel.



Align the nylon block on top of the blower with the panel cutout, insert and rotate the blower till the top is horizontal to lock it into the panel.



Blower is upright and locked in place.

The blower is mounted in the Flow Away position. This is always first. When the test is complete in this direction, the blower is removed and installed with the Flow Towards the operator.



## Set up Model N digital console



Place Laptop Console on blower case.



Set rocker switches OFF by pressing the "0" so blowers don't come on accidentally.



Remove the control cords



Place the cords next to the panel set.



### Power to console comes from:

1. Blower receives power from wall. Cord from console picks up this power to run the printer, computer and thermometers.
2. When blower is not plugged in, the console can get power from the short adapter plug that fits onto the end of the umbilical cord then goes to a wall socket.



Your laptop computer power supply plugs into the female plug inside the console. The power supply cord is then led through this hole to the computer above.

**OR,** Model L digital control panel for Models L64 and L63



The control panel can sit on top of the blower case with your laptop beside it.



## OR, Model E analog gauge clip

for models E43, E53, E54



The Gauge Clip attaches to the door or the Aluminium frame.

1. Loosen knob on gauge plate to accommodate door thickness.
2. Hold gauges at eye level.
3. Rotate clamp to grip door.
4. Tighten knob.

Gauges mounted on door. Top 60-gauge slides up and off to be used as handheld as needed.

**Zero gauges** by blowing in the tubes and capping them off with your thumb so the gauge stays at the top of its range for 30 seconds. If the gauge falls while capping the tube, there is a leak, stop to locate and fix it. Let the gauge fall back down and zero with small screwdriver supplied. **Do not turn more than 3 turns!** After another 30 seconds of gently tapping the gauge front, adjust the zero screw at the bottom of each gauge until it reads zero with the small slotted blade screwdriver. Tap the gauge with your finger to remove the mechanism's friction (hysteresis), and re-zero if necessary.



Move rocker switch to the right then turn the blower mounted speed control.

## OR, DM-1 digital gauge for models J64



The digital gauge can be hand held and used to measure static pressure, room pressure and flow pressure. Connect a tube from the panel to the right hand port of the DM-1 to get room pressure. Then connect a tube from the DM-1 to the blower to get flow pressure.

OR, DM-1 digital gauge



Take the 7ft red tube and throw outside, away from the air blast of the door fan and if outdoors, away from wind if possible. If you were testing from outside the room, this tube would then get thrown inside.



Insert the motor control connector into the receptacle till it clicks. E and J models will not have a control connector since the knob on the blower is used.



Plug the clear flow pressure pick-up tube into the nylon quick-connect on top of the blower. Gently push while giving it a quarter turn.



Make sure the 7ft red cord and thermometer are in the corner to the panel and the thermometer is on the backside of the panel. Plug power cord from Blower to wall outlet.

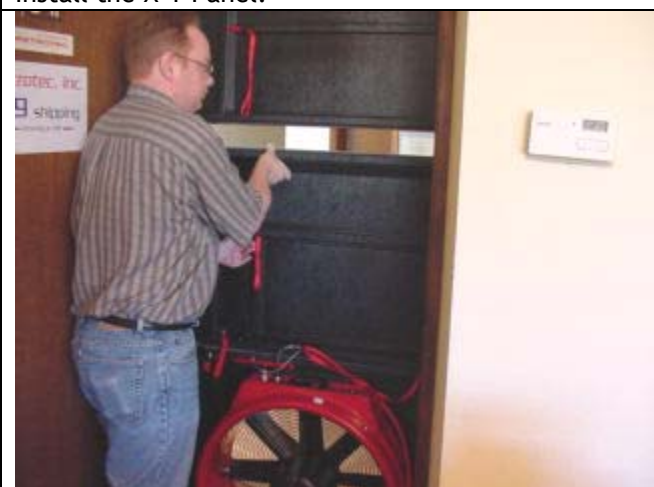




Install the X-Y Panel.



Expand the X-Y panel horizontally by hand.



Expand the X-Y Panel vertically with the center strap.



Cinch and lock the vertical strap in the cleat.



Tighten and lock the horizontal straps in their cleats.



Ensure rocker switches are OFF at the control panel. Plug power cord into wall outlet then into blower. Set rocker switch on blower to "remote" so it can be controlled by the console or control panel.



Red tube is always extended away from the air-stream on the opposite side of the door.



This detailed picture shows white dots that should line up. Later models may have molded dots.  
This vertical bar should line up on each sheet.



## Large room testing with 2 Blowers



### Models N64 and L64

Use the second blower panel. Install it above the lower blower panel. Install the second blower in the upper panel. For added security:

1. mount the panels on the far side of the doorstop so the weight of the blowers pulls them into the stop
2. apply 2-inch clear tape to both sides of the upper panel where it contacts the doorframe

Use second cord set from console to control the speed of blower #2.









### Models E64 and J64

Use speed controls mounted on blowers to adjust speed.

Read flow pressure from blower #1 then move the flow pressure tube from blower #1 and connect it to blower #2 for second flow pressure reading.

## Or, E43 Aluminum Frame Set Up

		
Open case	Take out pieces	Assemble flat. Line up numbers.
		
Connect corners	Fit frame loosely into doorway.	Adjust knobs to hold the size
		
Cover with cloth	Fit frame and cloth into door way.	



Actuate cam levers



Frame is installed.



Hook elastic under blower.



Use Velcro to hold blower



Finished installation.

This install will take about 20 minutes the first time. It will take less time with practice.

The main advantage of the Aluminum frame is slightly smaller package for shipment and lower cost.





# Leak Check

The Purpose of the leak check is to locate the major leaks in the enclosure before performing the door fan test. Often large holes are located that must then be sealed before the door fan test can begin. Sometimes the smoke test identifies dampers that are not closing correctly or not at all. If so, that damper must be repaired before the test can proceed.

**Leak check.** Blow air in to get +15 Pa room pressure & use smoke to locate leaks in:



- ✓ Rocker switch selects between OFF, Local or Remote.
- ✓ With rocker in OFF position, plug red power cord into wall outlet.
- ✓ Clear tube and 5-pin connector are plugged in
- ✓ Adjust speed from blower or console to get a 15 Pa room pressure. Ideal for finding leaks.



Turn on DM-1.  
Set all toggles into the UP position.  
Speed control knob is first turned all the way up till fan starts and then backed off quickly to desired room pressure.



Analog gauge clip uses speed control mounted on blower.



Retrotec Smoke Puffer is used to locate leaks and to detect airflow direction.

See section called: **Room Leak Location & Repair**  
It describes where to look for leaks.

## Smoke test & measure static pressure

The purpose of this test is to see whether there is a static pressure in the room prior to the door fan test. The door fan is not running and smoke is puffed in front of an open hole in the blower. If it moves slowly or not at all, no pressure exists. Minor pressures are cancelled out by testing both directions so we are therefore looking for significant movement of 2 mph (3kph). If the zone outside the enclosure is not completely connected with open doorways then you must check across each wall this is not connected. Walls to outdoors can be ignored.

If there IS smoke movement, the magnitude of the pressure must be measured with the room gauge or the handheld gauge.

		
<p><i>Check to see if there is any static pressure by puffing smoke near a known hole at the door. If the smoke moves, the next step is to measure the magnitude since the smoke is the best guide to its direction.</i></p>	<p>If the smoke moves, a handheld gauge or room gauge with tube under doorway is used to measure the static pressure.</p>	<p>Analog handheld gauge must be held firmly against a vertical surface to ensure zero shift is kept to a minimum.</p>

See section called: "Smoke test & measure static pressure for more information."

# Select Blower Range

## Principles of Infiltrometer Air Flow Measurement

The Infiltrometer can accurately measure airflow between 18 CFM and 6500 CFM. However, in order to measure accurately over this wide range, the range must be changed as described in the following section.

The Infiltrometer fan blade pushes air out the back of the fan creating a negative pressure in front of the blades. This negative pressure pulls air through the fan's rounded (venturi) shaped inlet. More negative pressure, more flow. The Infiltrometer has been calibrated so for each size of inlet opening and for each negative pressure (Flow Pressure) the flow rate in cubic feet per minute (CFM) is known. As flow decreases the Flow Pressure decreases eventually to the point that it becomes too low to read accurately.

By reducing the size of the inlet with the restrictor plate a given amount of air is forced to enter the blower at a higher velocity, resulting in a much higher flow pressure. (The fan speed must be increased in order to pull the same quantity of air through the blower with the restrictor plate in place.)

Therefore, as the flow rate requirement decreases, **such as in tighter buildings**, the size of the blower inlet must decrease to maintain a high and accurately readable Flow Pressure. Each inlet size has a pre-established configuration or range. Ranges are somewhat analogous to gears in a standard transmission car. The slower you go the lower the gear.

## Changing Ranges

The Retrotec 2000 Series Infiltrometer blower has 7 flow ranges for the greatest possible accuracy and versatility.

Range 22 (wide open with no restrictor plate installed) is the most powerful and most commonly used range. It is used to test buildings with ELA's greater than approximately two square feet. To use range 22, remove all the restrictor plates.

Range A (1st restrictor ring attached) is the next most commonly used range. It is used to test House/Rooms with ELA's between approximately one and three square feet.

Range B (2nd restrictor ring attached) is used to test House/Rooms with ELA's less than one square foot.

Ranges C8 requires the installation of the plate with 8 holes open, on top of the motor. Ranges C4 down to C1 require plugging some of the holes. Put plugs in the exact positions as shown - others will produce erroneous results. These very restrictive ranges are needed when testing very small rooms.

Each plug must be gently worked into the hole, but be careful you do not push the Panels right out of the doorway. (If the blower is ever turned around for reverse measurement, ensure none of the plugs have fallen out by peeking through the screen.)



## Range Selection Procedure

**Always start with the restrictor plate off** - that's called Range 22 for the 22" diameter inlet. Give the speed control a quick half turn to get the motor moving then QUICKLY turn the control DOWN if required. As you increase the fan speed, the Room Pressure gauge will rise. If the room is quite tight, it will rise very quickly. (Never let the Room Pressure rise above 60 Pa.)

### Range Selection When Conducting A Single Point NFPA Test:

The general rule regarding range selection is that the motor must be running at least at half speed. If the motor is running slowly, change to a more restrictive range so the highest possible flow pressure can be measured for the greatest accuracy.

The computer will warn you if the flow pressure is too low. If necessary, keep changing to a lower and lower range (more and more restrictive) until the Flow Pressure is much greater than the Room Pressure.

### Range Selection When Conducting a Multi-Reading Test:

The ISO procedure and sometimes the testing of relief vent capacity must be done using Multi-Point Readings. This is normally done at pressures starting at 60 Pa down to 10 Pa of Room Pressure. Taking 12 readings roughly equally spaced with the greatest concentration of readings at the lowest room pressures will yield the best results.

The general rule regarding range selection is to start with the blower running at maximum speed on the 60 Pa reading. The new software will allow multi-range readings to be taken but this takes more time.

### Cannot Achieve Desired Room Pressure with Plate Off

Each Door Fan blower is capable of measuring about 10 square feet of leakage area at a room pressure of 10 Pa. If the room to be measured has more leakage than this, there are two options:

- Option #1: Use a second blower to produce more flow and add the flow readings. Do NOT add flow pressures, they are not additive! Use the multi-blower feature of your software.
- Option #2: Instead of taking the Room Pressure up to 10, test at a lower pressure. The computer will advise of the amount of error possible.
- Option #3: Have leaks sealed until the proper Room Pressure can be obtained. Inspect to ensure that all dampers and doors are closed.

### Flow Range Diagram

Always start in the Flow Away position.

Adjust speed till room pressure is reached. Fan must be running at least at half speed and flow pressure must be greater than room pressure. If not, insert the Range A plate and keep changing to lower ranges till motor is at least half speed and flow pressure must be greater than room pressure.



Range 22 - Flow Away



Range A - Flow Away



Range B - Flow Away



Range C8 - Flow Away



Range C4 - Flow Away



Range C2 - Flow Away



Range C1 - Flow Away



Range 22 - Flow Towards



Range A - Flow Towards. The inlet is now on the other side. Look at “Flow Away” picture to see what the inlet must look like.



Range B - Flow Towards. The inlet is now on the other side. Look at “Flow Away” picture to see what the inlet must look like.



Range C8 - Flow Towards. The inlet is now on the other side. Look at “Flow Away” picture to see what the inlet must look like.



Range C4 - Flow Towards. The inlet is now on the other side. Look at “Flow Away” picture to see what the inlet must look like for C2 and C1 ranges below this one.



# Room and Flow Pressure Readings

**Make sure the blower is running at half speed or more before taking any readings.**

## Analog Gauge Readings

...from the Magnehelic gauges from the Model E Analog Gauge Clip

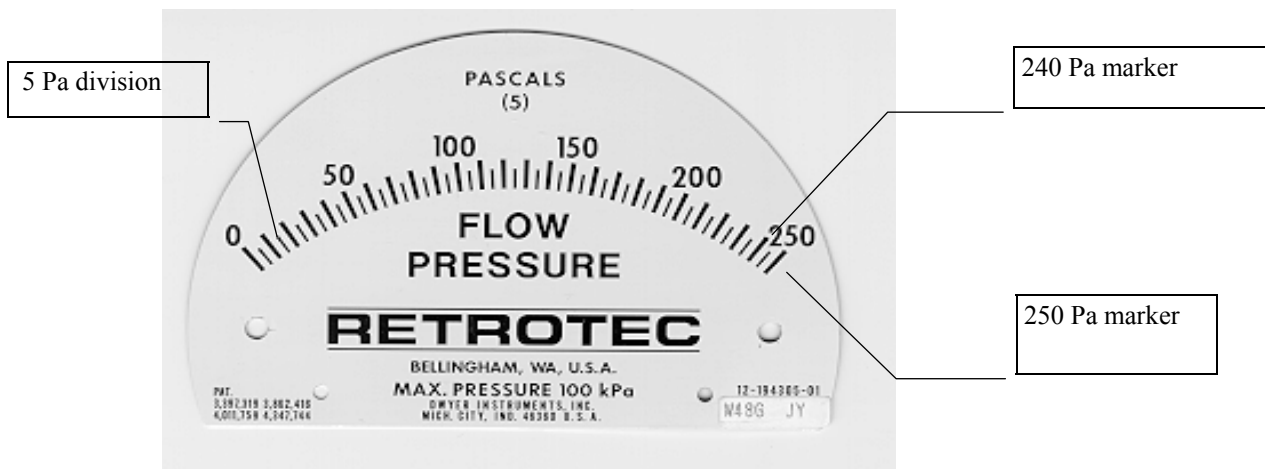
## Tubing Connections:

For the 60-gauge- connect the red tube from the upper port through the panel. When the blower is reversed, the red tube must be connected to the lower port.

For the 250-gauge, plug the clear tube from the lower gauge port into the blower.

## Gauge Reading Rules

- Ensure the gauges are zeroed.
- Read the gauges very carefully! The 240 Pa marker is easy to misread. Please refer to the diagram below for clarification.



Your eye must be perpendicular to the gauge faceplate to remove "parallax error".

- Wait 15 to 20 seconds after the last speed control adjustment to let the readings stabilize before writing down the test data or entering it directly into the computer. (For optimum results tap the gauges lightly to remove hysteresis and get the most accurate reading possible.) Take results from both Room Pressure and Flow Pressure gauges simultaneously since they will sometimes move up and down together.

### 60 gauge readings

Read the upper scale only. Reverse the tubes when you turn the fan around to test in the other direction.

### Taking Readings from Two Blowers

If one blower can't get adequate Room Pressure, remove the upper panel cover and install a second blower. To be absolutely sure the upper panel will stay in place during the test, **tape the edges of the upper panel to the door frame** using clear box sealing tape or masking tape. Don't use duct tape.

Adjust one or both speed controls until the Room Pressure is at the pressure requested by the Retrotec software. Ideally, adjust both blowers so that they are both running at about the same speed, and producing approximately the same Flow Pressure. Don't have one going flat out and the other idling. Both blowers must have their restrictor plates off, i.e. both on Range 22. Go through computer program per usual, but choose the multi-blower check off.



Read the Flow Pressure from both blowers and enter them into the software separately. Do not add them! If you do not have 2 flow pressure gauges in your system, read the bottom blower, then unplug the clear tube #1 from the bottom blower and plug it into upper blower. Read the upper blower flow pressure. Don't touch the speed controls between reading one flow pressure and the other.

Enter the flow pressures one at a time. After entering them, you proceed as usual.

# Digital Gauge Readings

## Model DM-1 Digital Gauge

for models N64, N63, L64, L63, J64, J63



1. Connect the 3 inch red tube from the Console or Digital Control Panel to the right port of the DM-1.

## Tips

**Re-Zero ...** prior to taking a new set of readings.

Changes in temperature or position may affect the zero by 0.1 to 0.4 Pa but overall the drift will be minor. It is best not to re-zero before a test is completed. Take readings for both pressurize and depressurize without re-zeroing the DM-1. Small changes in zero are offset by testing in both directions.

## Time Averaging

Experiment with one-second time averaging for stable pressure conditions and longer averages for windy conditions.





1. Turn ON the DM-1. Wait 30 seconds. Set first toggle to "ZERO"



2. Press "Set to Zero" on DM-1



3. Set all toggles up. They should be in the "Test, Room & Flow #1" positions.



4. When this light is lit, all connections have been made at blower and it's ready to go. Turn on the power to blower #1.



5. Adjust the speed control to get the required room pressure. The blower must run at half speed or more. If not change to a lower (more restrictive) range. Read the room pressure for 30 seconds.



6. When the desired room pressure is achieved, flip the toggle up to "Flow". Read the flow pressure (Flow #1) for 30 seconds. Turn the blower OFF with the rocker switch and turn the blower around to test the other direction. Go to Step 3.

## Two blowers for large rooms, (see also section on flex-duct testing)

Use the second control cord for blower #2. Install while the blower is on the ground, and then install the blower in the panel.

Complete steps 1 to 3 on the previous page first. Then go to step 7.



7. Turn on the power to blower #1 and #2.



8. Adjust the speed controls to get the required room pressure. Read the room pressure for 30 seconds.



9. When the desired room pressure is achieved, flip the toggle up to "Flow". Read the flow pressure (Flow #1) for 30 seconds.



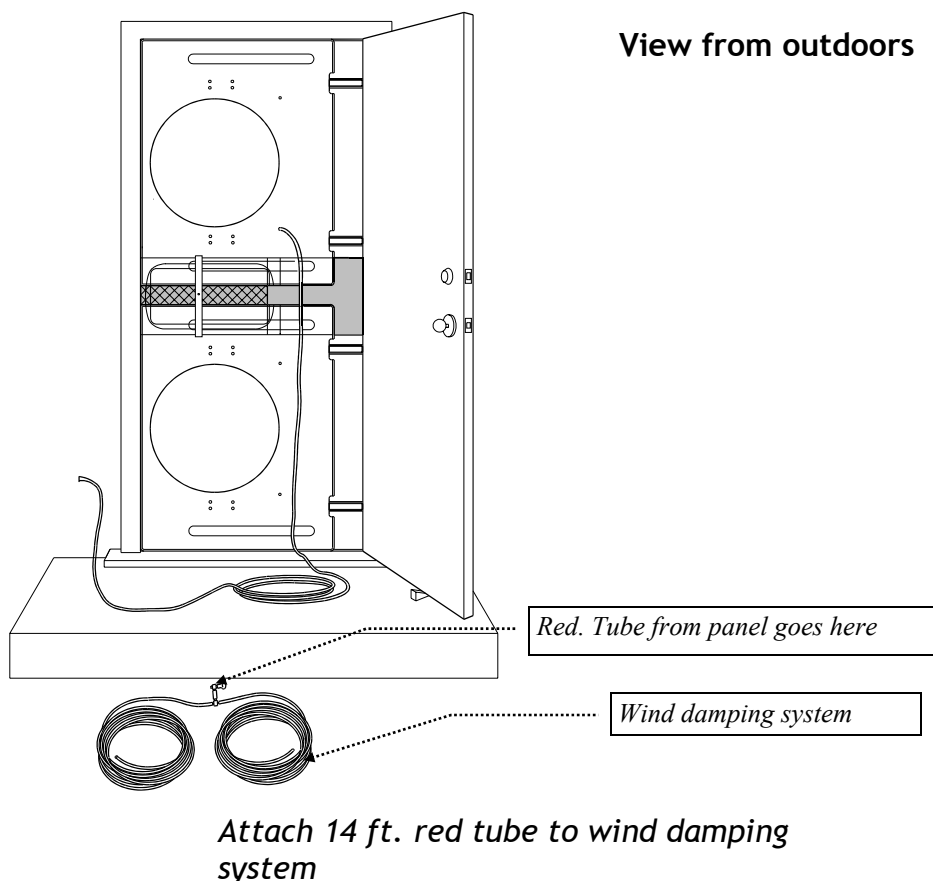
10. Read the flow pressure (Flow #2) for 30 seconds. Turn the blower OFF with the rocker switches and turn the blowers around to test the other direction. Go to Step 6.

# Windy Conditions

If the gauges fluctuate more than 1 Pa due to wind, follow these steps to reduce the fluctuations in the gauge reading.

**Tip:** instead of taking readings at low room pressures around 10 Pa, perform the test at 60 Pa room pressure. The effect will be to reduce the retention time slightly but overall the test will be more accurate.

Plug the red tube into the open end to the T on the 25' + 50' red wind damping tubes. The tubes are placed away from the building to avoid the pressure pulse that gets created when the wind hits the wall. Cover the end of the tube with sheet material or a box to stop the wind from blowing into the end.





Use averaging on digital gauge to reduce the effect of wind.



Set the Time averaging to 5 seconds. If the second reading varies more than 10% from the first reading, set it to 10 seconds. If the variation is still too much, set it to 30 seconds. Take at least three readings. The last two must be within 5% of each other in order for it to be useable.

## Deluxe Wind Damping System to Stop Gauge Needles Moving

If the room pressure gauge fluctuates more than 1 Pa due to the wind and the standard two tube damping system does not reduce them sufficiently then the optional wind damping system may be more effective. The time constant of the system is designed to decrease swings due to wind.



If swings are due to other causes the wind damping system may not help.

Place the Deluxe Wind Damping System case on the ground/floor outside the room or building to be tested. If it has not been stored at the ambient outside temperature, leave it for half an hour to acclimatise before starting the test. DO NOT let the sun or any other heat source beat on the capacity tank.

Plug the RED tube coming from the panel into the smallest connector (of the five) on the back of the capacity tank.

Place the wind damping system in a box and close it up. The box must be on the opposite side of the doorway from the pressure gauges and away from the air blast of the door fan and the wind. This is very quick and often sufficient to stop fluctuations.

Observe the gauges. If still fluctuating more than 1 Pa, attach CLEAR tubes (in any combination of lengths) to each of the four 90° connectors on the back of the capacity tank. Lead the CLEAR tubes to areas around the enclosure as far away from the walls as possible. Lay the tube flat on the ground and cover the ends with cardboard to stop air movement at the end of the tube. DO NOT seal the tube ends.

Observe the gauge needle for at least 30 seconds with the blowers off to ensure wind effects are understood then turn on the blower to establish the required pressure. Again, observe for at least 30 seconds. Some experimentation may be necessary to get the best gauge readings.

CAUTION: Do not allow tube ends to dip into water because this will seal them off.

If the wind fluctuations are still too great.

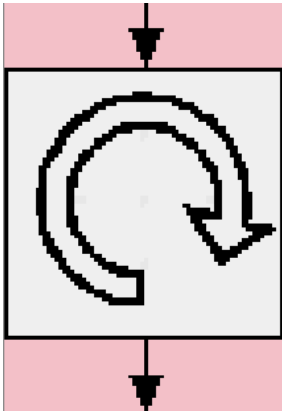
Increase test pressure so the wind fluctuations are no more than 20% of measured pressure. Do not try to measure the static pressure at time of door fan test. Call it zero.

Take the room to the same positive and negative test pressure.

Observe the readings for 60 seconds and take the average.

This procedure will give a slightly (5 to 20%) greater leakage area than a no wind test which will reduce the retention time by 5 to 20% making the test failsafe.

## Mixing or No Mixing (Descending Interface) or Extended Discharge

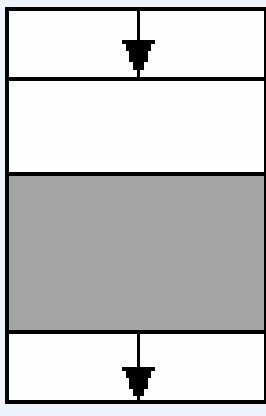


**Mixing** means that as agent leaks out the incoming air is continually mixed with the remaining agent in the room so that the concentration is constant throughout. Mixing gives equal protection to all levels in the enclosure. Sometimes the air-handlers must remain running during the retention time to keep equipment cool. Other times mixing must be used because protection is required at high levels. Often mixing is unintentionally created by convection currents caused by hot equipment or equipment cooling fans that must remain on during the retention period. The initial concentration must be made greater to allow for the drop in concentration.

This icon is used throughout the program and on reports to show that mixing will take place.



To determine if there is mixing, a smoke test must be performed where small puffs of smoke are placed near the protected equipment. If the smoke puffs immediately dissipate, there is continual mixing. If in doubt, it is possible to pass both the mixing and the no mixing cases.



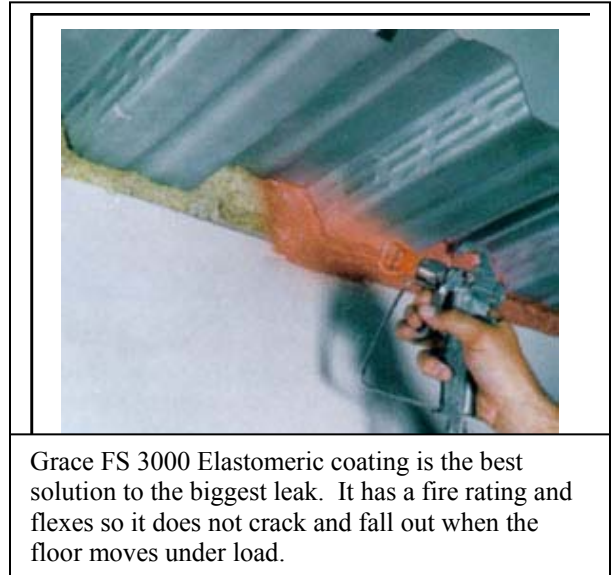
**No Mixing or Descending Interface** means that as agent leaks out the incoming air is NOT mixed with the remaining agent in the room so that a layer of air forms on top of the agent. NO Mixing gives protection only below the air-agent interface.

The greater the initial concentration, the faster the agent will be lost.

This icon is used throughout the program and on reports to show that NO mixing will take place.

# If the room fails

Equipment calibration is often blamed for these failures but in over 12 years of 500 companies testing, it has never been a factor. It is usually that the room leaks too much. Airsealing looks simple but should be left to Weatherization contractors; NOT general contractors who may think they can do it but seldom can.



## Enclosures with excessive leaks

Seal leaks at all elevations and retest.

## Enclosures with excessive upper leaks

These rooms may not pass the whole room test because of excess leakage where the walls connect to the upper slab. Just like for any other room, seal all leaks below ceiling, even very small ones. The floor slab to wall joint must be sealed throughout. Don't worry as much about leaks through electrical outlets and switches.

1. For rooms with suspended ceilings, do a BCLA flex duct test. Depressurize the entire space above the false ceiling.
2. For smaller rooms (up to 1000 square feet - about 250 lb. of agent) use polyethylene taped under suspended ceiling. Test in positive direction only; the software will adjust measured ELA based on static pressure. You may also cover and register or duct coming out of the ceiling.
3. BCLA may also be estimated with AHJ and entered manually. Use the spreadsheet on the Lower Leak tab.
4. Accept larger rooms with thorough smoke pencil inspection per 4-7.2.3 The AHJ should not be able to uncover any remaining discernible leakage.

**Increase agent quantity?**



This will only help if there is continual mixing during the retention period. If the air-handlers are shut off at discharge, more agent will give less retention time.

Rooms with suspended ceilings will double the retention time usually when agent is discharge above the ceiling for mixing and no mixing cases.

Extended discharges will increase retention time for the duration of the discharge.

### **Eliminate Static pressure during retention**

In cases where this is large, reducing it can increase the time.

### **Reduce High Static Pressures if present**

Have the building HVAC shut down on discharge if possible. Test run the enclosure without the static pressure to see if it will make enough difference to have it done.

### **Reduce the Minimum Protected Height**

Determine what exactly needs to be protected in the room for the required retention time. Open up the cabinets to see if they have anything in them or can a lower level be chosen.

### **Reduce the Minimum Required Retention Time**

Base this on the response time of the fire department or local operators who would be trained to deal with the fire event. See Step 12 in the Guide for help.

### **Improper training of testing technician**

Learning how to operate the software and hardware and analyse room problems is often a huge factor in passing enclosures and avoiding future problems.

## Flex duct installation for ceiling neutralization



Position the flex-duct case under the ceiling tile in which it will be installed and open the case. There must be minimal obstructions to airflow above and around the ceiling tile selected.



Insert the flex-duct into the T-bar ceiling framework. The square sheet goes in next.



. Hook the cuff under the lower foot of the blower and over the nylon block on top of the blower flange.



Secure the Velcro cinch strap on the flex-duct blower cuff.



A ceiling tile is removed to allow the flex duct to be mounted



The upper blower is measuring lower room leaks whilst the lower blower neutralizes leaks above the ceiling.



Note how the flex-duct mounts in one half the tile opening whilst the Retrotec blanking sheet that comes with the flex duct fills the rest of the space previously occupied by the ceiling tile.

In the corner is a 2x2 ft. grille leading to the ceiling plenum. This grille should be sealed off to better allow the ceiling to be neutralized.



Both fans are running. The ceiling tile is lifted to see which direction smoke travels to determine ceiling neutralization. When the smoke does not move the lower leaks can be measured.

## Lower leak tests using: Plastic-on-Ceiling procedure

This procedure is much more time consuming than using the flex duct. It consists of measuring the Lower Leaks by covering the ceiling with plastic. This takes a lot of time but does give good results particularly in small rooms.

A temporary solid barrier to leakage through a suspended ceiling can be used instead of the neutral pressure used in the B-2.6.2 "Flex Duct" test. The most commonly used material is 2 or 4 mil polyethylene plastic ("visqueen"), under the ceiling tiles, taped to the T-bar grid and perimeter walls using 2" paper masking tape.

There are two distinct situations where this technique may be appropriate:

- 1) If the room does not have slab to slab walls, or
- 2) If the room is too small for a standard BCLA Flex Duct test (e.g. less than 250 to 500 sq.feet of floor area).

While this approach could be used on a room of any size, it is rarely used on rooms larger than approximately 1,000 square feet, for the following reasons:

- 1) The larger the area, the more expensive and disruptive the test becomes.
- 2) If the room is greater than 500 square feet and has slab to slab walls, a BCLA Flex Duct test can generally provide acceptable predictions, and
- 3) If the room is greater than 1,000 square feet, a through smoke pencil inspection per 4-7.2.3 of the standard can provide sufficient assurance that no significant below ceiling leakage exists which would cause an unacceptable halon loss. If the smoke pencil inspection missed some leakage, it is unlikely that this overlooked leakage will be significant enough to cause the room to fail. It is important to recognise that the larger the volume, the less sensitive the room will be to leakage. If two rooms are built to the same relative standard of construction, the smaller one will lose halon faster due to its less favourable surface to volume ratio.

The plastic under the ceiling technique is the Appendix C procedure.

**"CB-2.6.2.9** An alternate method for measuring the below ceiling leaks consists of temporarily sealing identifiable ceiling level leaks using a flexible membrane, such as polyethylene sheet and tape, and then measuring the below ceiling leakage solely using door fans drawing from the lower part of the room. No flex duct is needed. Examples of sealable leaks are undampened ceiling level supply registers or return grills, or an entire suspended ceiling lower surface."



The principal deviation from the normal procedure is that the test can only be conducted in one direction, i.e. as a pressurization test. Depressurizing almost inevitably pulls down the plastic.

In a room without a suspended ceiling, plastic could be used to seal off undampered ducts at ceiling level to better determine how much of the room leakage is below ceiling level. Note that unsealed cracks at the roof wall joint would now be assumed to form part of the BCLA, resulting in a more conservative retention time (perhaps too conservative). In such a situation, the test can usually be done in both directions, as the plastic can be adequately restrained.

## **Conducting the Test**

The standard Whole Room Test must first be conducted to determine the whole room ELA. No temporary sealing of any openings is permitted.

Installing the plastic is simply a question of time and common sense. The plastic doesn't have to be heavy duty - 2 mil seems to be a good compromise between light-weight and workability. Fresh 2" painter's masking tape sticks well and doesn't peel off the paint. Cutting the plastic into approximately 10 feet wide strips makes it easier to install. Avoid attaching the plastic to sprinkler heads! Make sure the wall edges of the plastic are taped to the wall, not just the T-bar.

Run the test from the Lower Leak tab of CA2001 and choose "Plastic on the ceiling test". Perform the test in the pressurization mode only.

If the BCLA Plastic test fails, and your smoke pencil inspection finds more leaks below ceiling level to be sealed, you should theoretically remove the plastic, redo the Whole Room ELA test, and then re-install the plastic and redo the BCLA test. Obviously, this is not practical. An alternate approach is to seal the leaks and redo the BCLA test until the room passes, using the original Whole Room ELA value. There is no real need to redo the ELA test, as using the original value will give a slightly more conservative retention time than would be obtained with an actual final Whole Room ELA measurement. Of course, the Whole Room ELA can be remeasured and the results rerun after the plastic is removed.

## **Fastest Way to Seal the Ceiling or Register (Grilles)**

Retrotec sells a product called Grille Mask. It is a brightly colored masking tape looking material. It comes in 8 inch wide rolls so it is very fast to apply. A case of five 200 ft. rolls currently sells for \$125 plus \$29 for a waist belt to hold the duct mask while sealing registers. Overhead applications, such as sealing T-bar's are best done with a paint roller and long extension handle. Only the join in the T-bar needs to be taped over. Pay particular attention to the corners.

## Lower leak Estimates using: Leak audit

Set the door fan to produce a 15 Pa positive pressure. Open the door panel up to witness smoke moving at “full speed”. Locate enclosure leaks, measure the open area. Test the leak with smoke in the area where the leak was measured. Mark down the % of full speed that each leak appears to be. This will tell you whether something upstream from the leak was slowing it down so in effect by knowing the area and speed you are determining the approximate effective size of each leak.

Mark this data down for later entry into the Leak Audit button on the Lower Leak tab that lights up when you enter “Estimated”.

**CleanAgent 2001 (version 2.2.2) Demonstration Copy - Unlicensed 30 day demo period.**

Home | Building / Room | Agent / Test | Total Leaks | **Lower Leaks** | Retention | Field Cal | Wind Losses | Venting | Saved Tests

**Example Building a Test #1 in Change range experiment**

**Below ceiling leakage** — ☐ Flex-duct test ☐ Plastic on ceiling test ☒ **Estimated**

Operator:  Smoke:  Temperature during test (°C):  inside  outside

Direction:  Static pressure:  Pa

**Flow Away from Operator, Depressurizing** Range for room pressures: -10.0 to -13.0

No. of points	Blower range	Room pressure
Single-point	No range selected	Flow pressure
<input type="checkbox"/> Multiple Blowers / Multiple Ranges		

**Flow Towards Operator, Pressurizing** Range for room pressures: 10.0 to 13.0

No. of points	Blower range	Room pressure
Single-point	No range selected	Flow pressure
<input type="checkbox"/> Multiple Blowers / Multiple Ranges		

	BCLA sq.m.	@ Pa	F	Slope n	Intercept k1	Correlation	Standard error	BCLA	@ Pa
Depressurizing									10
Pressurizing									10
Average			.50						10

ISO & Vent ELA at: ☒ 10 pa ☐ Column Pressure ☐ Vent Peak

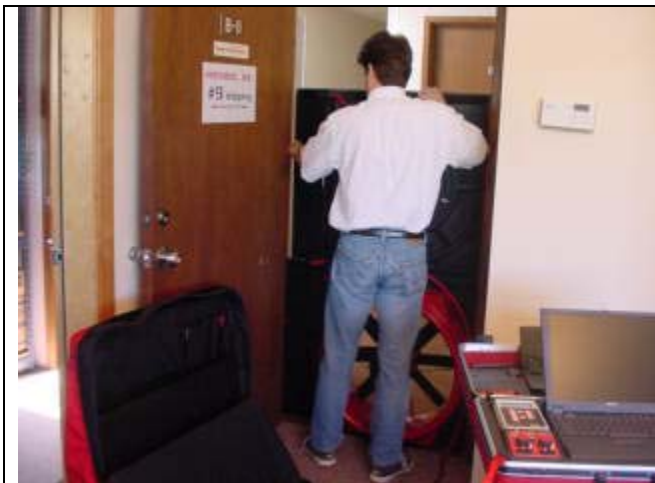
Modify Pa:

Leakage area, AI  sq. m. @ 10 Pa or Lower leak fraction, F  (  %) or **Leak audit**

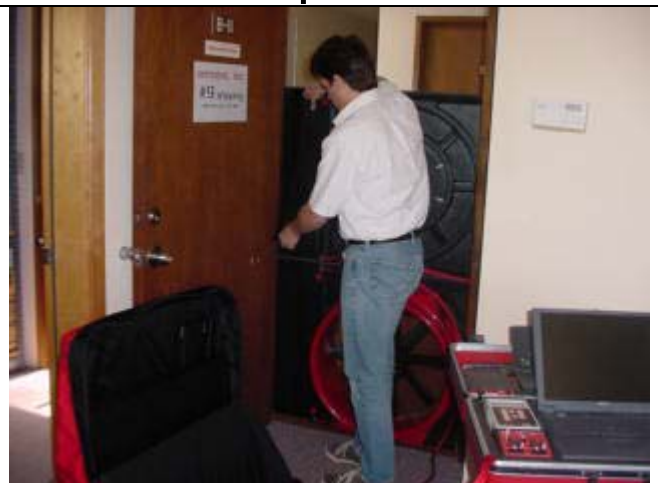
**Calculate/Save**

See the CA2001 Software Instructions.

## Field calibration check with calibration plate



Place the second Blower Panel on top the first Blower Panel and expand into position.



Insert the fill-in sheet in the Blower Panel.



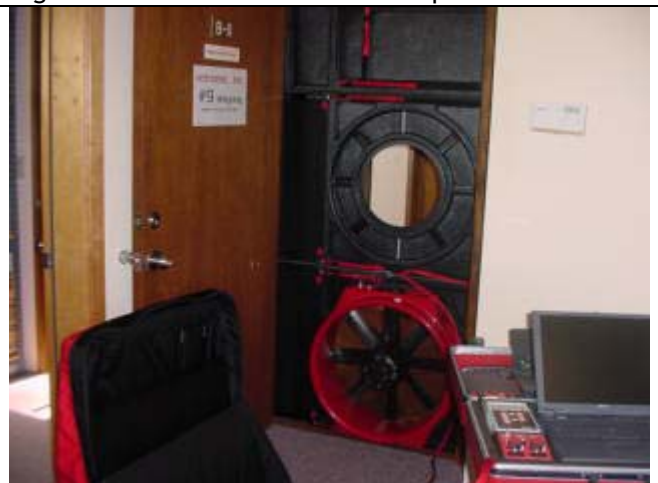
Place the X-Y Panel on top the Blower Panel.



Tighten and lock the X-Y Panel straps.



Panels installed with upper panel cover with calibration holes ready for performing the field calibration test.



Fielded Calibration Plate opened.

The Field Calibration Check is a procedure which enables the AHJ to determine that the door fan to be used on a test is sufficiently accurate, and that the technician knows how to operate the equipment. It is also a useful training exercise for an inexperienced operator gaining familiarity with the equipment.

The Infiltrometer is set up to measure the BACKGROUND leakage of a small room.

Next, a hole of known size is opened up and the room is re-measured with the Infiltrometer. The new increased leakage area reading should be the sum of the first, plus the known hole size. The difference between the actual increase and the measured increase is the Infiltrometer and/or the operator error, e.g.:

1. The room is measured at 200 square inches of leakage area.
2. A 144 square inch hole is opened up.
3. The new leakage area should read:  $200 + 144 = 344$  square inches.
4. If the Infiltrometer measures the new total leakage area at, say, 350 square inches, the difference is  $350 - 200 = 150$  square inches, which is  $(150 - 144) = 6$ ,  $6/144 \times 100\% = 4.2\%$  error.

NFPA 12A and 2001 specifies that the door fan system has to be within  $\pm 15\%$ .

This test should be performed from the Field Calibration tab of CA2001.



## Tall doorways



Small X panel being installed.



X- Panel will add 10 inches to the height of the panels.



The small and large X-Panels can be positioned above this panel set to fill doorways over 10 ft. tall!

## Packing up and moving equipment



Blower case fits on Ruaax cart.



Panel case goes over top



Accessory bag goes on top. Console is carried.



Case protects blower for day to day transport but when shipped by separate carrier such as UPS the case must be placed inside its original shipping box or the equivalent.



Make sure the smoke puffers go into the special outside pockets they were designed for. If packed inside a computer case they may destroy the computer!



Packing must be marked so it gets put back in the same way.






Cart folded up.



# Large building Testing

Retrotec's multiple fan panels can be added in modules to test any building of any size. It is very rare to require more power than the standard double blower system but if needed, Retrotec can rent as many blowers as needed for any job.

	<p>In the UK, air leakage tests must be carried out in accordance with CIBSE TM23 on all buildings over 1000 sq.m. The Retrotec Model M55 shown will test enclosures up to 2880 sq.m. of envelope area at the minimum allowable leakage of 10 cu.m/hr./sq.m. It can be expected that much larger buildings can be tested with the same system if they perform better than this minimum.</p>	
<p>Using two systems in two doorways or in one double doorway will increase the envelope area to 5,760 sq.m. Retrotec software will handle up to 18 blowers allowing for testing of buildings with 17,280 sq. m. of envelope area. Retrotec equipment, software and field training expertise are available immediately.</p>		<p>The latest draft of Approved Document L of the Building Regulations (Conservation of Fuel &amp; Power) which covers England &amp; Wales was published in April this year. Following approval by the European Commission this draft will be finalized and published in August 2001, becoming effective from February 2002. From this date all plans submitted for Building Control approval must comply with these new requirements.</p>



# Recalibration of Retrotec Infiltrrometer

The NFPA Appendix C requires recalibration of only the room pressure gauge every year. Ask Retrotec for an exchange 60 Pa. gauge and be sure to specify whether the tubes go out the back for the model 870 “kickstand model “ or out the side for the model 970 suitcase style. Gauge clip styles all go out the side.

Users of CA2001 software will be supplied with a new calibration file to download that will record the required date and update your software’s printout of its calibration data.

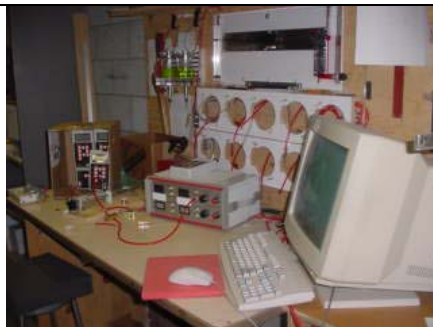
The NFPA Appendix C requires recalibration of the complete system every 5 years. The entire system must be sent back for recalibration and checking in our flow chamber. Send back both blowers, low flow plates and console. Panels don’t need to be returned for the 5-year calibration, but we will check them out if you do send them back. New certificates will be issued.

Our series 600, 700, 800 and 900 and 2000 flow measurement systems do not require more frequent recalibration unless they are damaged to the extent that their physical dimensions are changed drastically, or if Field Calibration Checks repeatedly show that the system is inaccurate.

The measurement method used in our system relies upon the physical dimensions of an annular nozzle which has well-documented flow characteristics. Flow is proportional to the square root of the pressure drop across the nozzle. Obvious changes in nozzle size introduce relatively small errors.

We have checked numerous Retrotec Infiltrmeters after one (1) year of field use and have never found their calibration to be out more than the specified accuracy of (+/-) 5 percent.

A quick check of the gauge can be made by "Y" connecting the HOUSE PRESSURE and FLOW PRESSURE gauges together and elevating the pressure in the common tube to see if they read the same. It should be noted that similar absolute percent errors in these two gauges cancel each other out to a great extent in a test.



Calibration facility for gauges.



Calibration facility for blowers.



## Retrotec Gauge and System Calibration

All Retrotec Gauges are calibrated against a Master Reference Calibrator (MRC) that has an accuracy of  $\pm 0.1$  Pa or 0.1 %. The concept Retrotec equipment uses is that all of Retrotec's products are now calibrated against the same reference. When a blower is built, it is calibrated against the MRC for pressure and an ASTM flow chamber for holes. A correction formula is derived for that blower to eliminate all the error. Each gauge used in a system, is calibrated against the MRC also and correction equations are derived that will allow for correction over the entire range. The Retrotec software will have the correction equations for each gauge and blower embedded in the software so all readings are corrected automatically.

For every door fan reading, three calibration corrections occur in the software;

1. the room gauge reading,
2. the flow gauge reading and
3. the blower itself.

Additional corrections:

4. Each flow pressure reading is corrected when the flow is towards the operator to reduce the flow pressure by the room pressure to properly reference the reading.
5. Each flow reading is corrected for temperature.
6. Barometric pressure is **not** corrected for because to do so would reference the reading to local ambient conditions at the time of the test. Rather, flows are referenced to STP conditions which are: 101,325 KPa, 50% relative humidity and 20C. Humidity can be ignored because its effect is negligible.

### Gauge calibration procedure

When the Retrotec CA2001 software is created, a calibration certificate records all correction formula that are then used in the software. Only Retrotec can compile these certificates but it is possible to have local instrument companies perform the calibration. Retrotec will then take their data and create the calibration certificate that can be emailed or mailed in a small text file. This file is imported into the Retrotec software to allow CA2001 to perform all the corrections automatically. The software allows the operator to select the certificate that can be used for any particular test. Normally the operator would use the latest calibration certificate but there are two cases where another certificate may be used:

1. Change back to an old certificate to rework or rerun old data in the form of a new test. Old tests will retain the calibration information along with the test so no change would have to be made unless a new test was run.
2. If different blower and/or gauge combinations were used, a different calibration certificate can be utilized by using the "Change" button on the Home tab. Each one of these combinations requires a separate certificate that can be sent by Retrotec upon request.

For a complete calibration, take the gauge up to full scale, hold it there for 60 seconds, release the pressure and zero the gauge. Apply positive pressures to the upper port and a negative pressure to the lower port such that changes in atmospheric pressure will not affect the calibration. Record the reference and gauge readings for each point on the table below. Ensure that all zero shift of the reference gauge is removed for each reading.

The Ascending and Descending readings must be taken at the target pressures shown +/-1 Pa if the pressure is below 20 Pa, +/-2 Pa if the pressure is below 50 Pa or +/-5 Pa if the pressure is above 50 Pa. That is to say the readings must be taken at these target points within these limits; these limits do not describe the accuracy required.

#### **60 Pa Analog Room gauge target pressures**

Ascending pressure	0	10	14	17	25	35	
Descending pressure	50	35	25	17	14	10	0
Final pressure	8	12	15	20	30	40	55

#### **250 Pa Analog Room gauge target pressures**

Ascending pressure	0	30	40	60	90	130	
Descending pressure	180	130	90	60	40	30	0
Final pressure	25	35	50	75	100	150	200

#### **DM-1 Digital Room & Flow gauge target pressures**

Ascending pressure	0	10	14	17	25	35	
Descending pressure	320	35	25	17	14	10	0
Final pressure	8	12	15	20	30	40	350

**Gauge Calibration**

Gauge Serial #  Gauge Type: **Analog 250** Certificate: **83**

☒ **1st Set** In the system, this gauge will be used for:

☐ **2nd Set** Gauge Notes:

☐ **Final Check**

Gauge Calibration											
1	Reading 1:	<input type="text"/>	<input type="text"/>	Target: <b>30</b> +/-1							
	Reading 2:	<input type="text"/>	<input type="text"/>	FROM	<input type="text"/>	TO	<input type="text"/>	x	<input type="text"/>	+	<input type="text"/>
	Final Check:	<input type="text"/>	<input type="text"/>	Target: <b>25</b> +/-1		CR:	<input type="text"/>	Error	<input type="text"/>	Pa	
2	Reading 1:	<input type="text"/>	<input type="text"/>	Target: <b>40</b> +/-2							
	Reading 2:	<input type="text"/>	<input type="text"/>	FROM	<input type="text"/>	TO	<input type="text"/>	x	<input type="text"/>	+	<input type="text"/>
	Final Check:	<input type="text"/>	<input type="text"/>	Target: <b>35</b> +/-1		CR:	<input type="text"/>	Error	<input type="text"/>	Pa	
3	Reading 1:	<input type="text"/>	<input type="text"/>	Target: <b>60</b> +/-2							
	Reading 2:	<input type="text"/>	<input type="text"/>	FROM	<input type="text"/>	TO	<input type="text"/>	x	<input type="text"/>	+	<input type="text"/>
	Final Check:	<input type="text"/>	<input type="text"/>	Target: <b>50</b> +/-1		CR:	<input type="text"/>	Error	<input type="text"/>	Pa	
4	Reading 1:	<input type="text"/>	<input type="text"/>	Target: <b>90</b> +/-2							
	Reading 2:	<input type="text"/>	<input type="text"/>	FROM	<input type="text"/>	TO	<input type="text"/>	x	<input type="text"/>	+	<input type="text"/>
	Final Check:	<input type="text"/>	<input type="text"/>	Target: <b>75</b> +/-2		CR:	<input type="text"/>	Error	<input type="text"/>	Pa	
5	Reading 1:	<input type="text"/>	<input type="text"/>	Target: <b>130</b> +/-5							
	Reading 2:	<input type="text"/>	<input type="text"/>	FROM	<input type="text"/>	TO	<input type="text"/>	x	<input type="text"/>	+	<input type="text"/>
	Final Check:	<input type="text"/>	<input type="text"/>	Target: <b>100</b> +/-5		CR:	<input type="text"/>	Error	<input type="text"/>	Pa	
6	Reading 1:	<input type="text"/>	<input type="text"/>	Target: <b>180</b> +/-5							
	Reading 2:	<input type="text"/>	<input type="text"/>	FROM	<input type="text"/>	TO	<input type="text"/>	x	<input type="text"/>	+	<input type="text"/>
	Final Check:	<input type="text"/>	<input type="text"/>	Target: <b>150</b> +/-5		CR:	<input type="text"/>	Error	<input type="text"/>	Pa	
7	Reading 1:	<input type="text"/>	<input type="text"/>	Target: <b>999</b> +/-1							
	Reading 2:	<input type="text"/>	<input type="text"/>	FROM	<input type="text"/>	TO	<input type="text"/>	x	<input type="text"/>	+	<input type="text"/>
	Final Check:	<input type="text"/>	<input type="text"/>	Target: <b>200</b> +/-5		CR:	<input type="text"/>	Error	<input type="text"/>	Pa	

Ru Reading

Retrotec gauge calibration software was developed especially for meeting NFPA and ISO requirements.



# Troubleshooting, Maintenance, Repair

## **The printer tried to print but colors are missing or they don't match.**

The BJ ink cartridge may be out of ink. Perform a Nozzle test by powering the printer off; hold the power button down until it beeps 4 times. The Nozzle test will show which tanks are empty. If no ink is dispersed, perform several head cleanings. With the printer on, press and hold the resume button until the printer beeps twice (3 times for a deep print head cleaning). If no ink is dispersed, you may need to replace the ink tank.

## **My Canon printer needs some repair. Where can I get service?**

You have two options:

- Find a Canon Authorized Service Facility near you using our web site.
- InstantExchange option

## **Find a Canon Authorized Service Facility**

Use the following web site to choose your product, and then select Service Options to locate a Canon Authorized Service Facility near you.

<http://consumer.usa.canon.com/techsupport/index.html>

InstantExchange

Call (757) 413-2848 and follow the voice prompts to exchange a defective Canon product for a Canon factory refurbished product.

Monday-Friday: 8:00a.m. - midnight ET.

Sat.: Noon - 8:00p.m. EST.

Please refer to your product's warranty card for full details.

InstantExchange is subject to certain restrictions and limitations.

The InstantExchange option is available:

- only for certain printer, facsimile and multifunction models;
- only during the express limited warranty period for such products; and
- only in the continental United States, Alaska and Hawaii.

## **BJ30 Self Test Print**

This printer has a self-test function that checks the operation of the printing system and the print quality. All characters are printed repeatedly. To start the ripple pattern test:

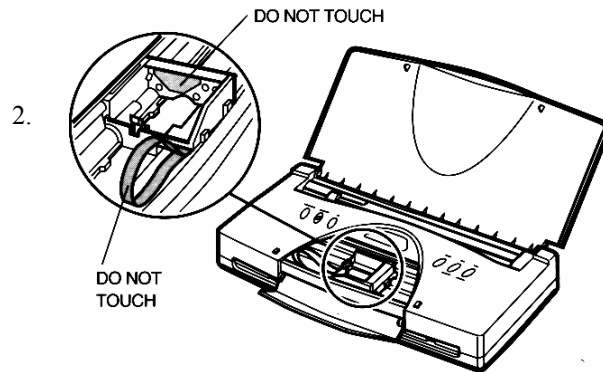
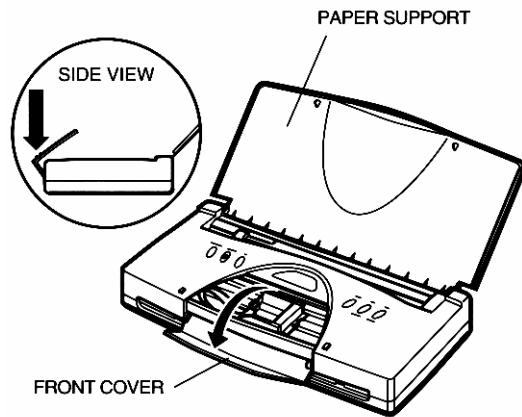
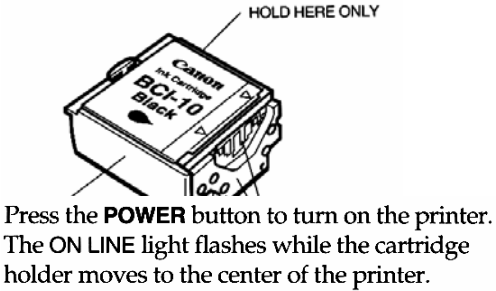
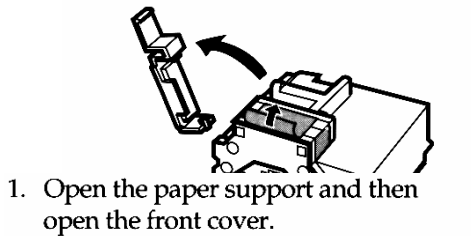
- Make sure that the paper is loaded and turn the power switch ON.
- Press and hold down the MENU button until the printer beeps twice. A "1" should appear in the display.
- Press the MENU button. The printer should begin to print the test pattern.
- To end the test, turn the power switch off.

**Print head cleaning...** will correct the problem of the print head moving but not print on the page or no ink.

### BJ30 - Replacing the Ink Cartridge . . . including Print Head Cleaning

Remove the orange cap from the print head and then remove the orange tape.

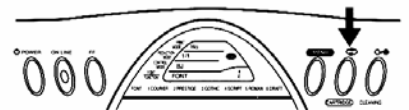
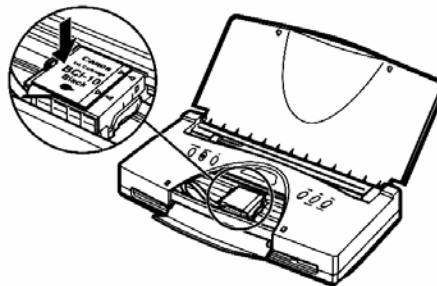
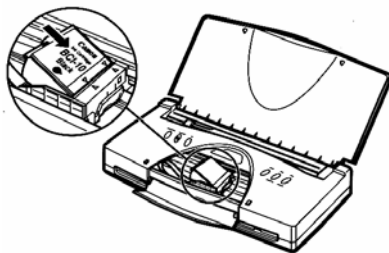
Handle the BJ cartridge with care.



3. Gently place the BJ cartridge into the cartridge holder. Insert the print head into the cartridge holder first.

4. Press down on the left side of the BJ cartridge.

5. Close the front cover, and then press the **CARTRIDGE** button to move the cartridge holder to the right side of the printer.



## BJ30 Print Head Cleaning

The print head contains nozzles through which ink is propelled onto the paper. The print head nozzles must be free from paper particles and dust in order to maintain a high level of print quality.

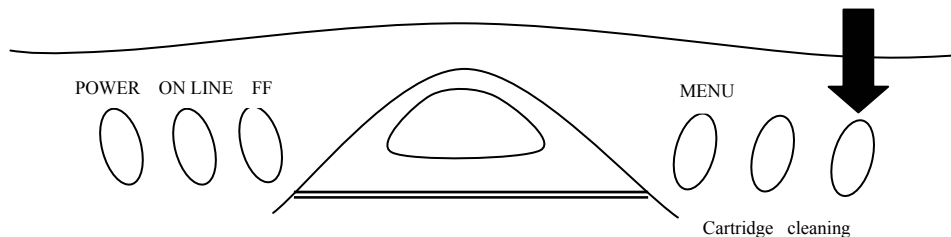
The printer has an automatic cleaning function that clears away paper particles and dust. The printer initiates this automatic cleaning function when you turn it on after it has been off for a certain period of time.

You need to activate the print head cleaning procedure whenever your print quality is poor. There are two types of print head cleaning:

- Quick cleaning to improve print quality problems. This procedure takes about 30 seconds.
- Extensive cleaning for severe print quality problems. This procedure takes about one minute, and uses more ink than quick cleaning. Therefore, use this product only when the quick cleaning procedure does not improve your print quality.

To start print head cleaning follow these steps:

1. Make sure the printer is turned on and on-line.
2. To start the quick cleaning procedure:
  - Press and hold the **CLEANING** button for approximately one second, until the printer beeps.

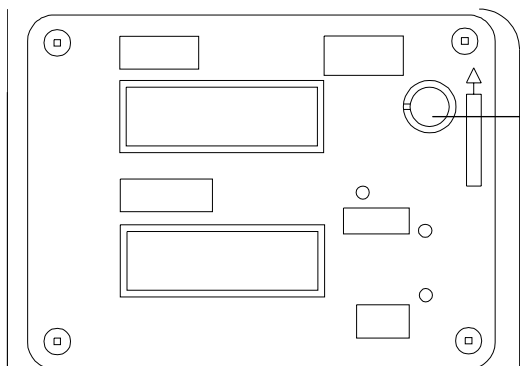


3. To start the extensive cleaning procedure:
  - Press and hold the **CLEANING** button for about six seconds. The printer beeps followed by a second beep several seconds later.

While the print head is being cleaned, the ON LINE light will blink.

Call Retrotec if the information in this section doesn't help you.

## Balancing Indoor/Outdoor Temperature Readings



*Balancing potentiometer for the thermometers.*

The control console includes a balancing potentiometer to make the OUT TEMPERATURE agree with the IN TEMPERATURE. The value is mostly cosmetic since a 10°F error only yields a 1% error. Because overall equipment accuracy is 5%, chasing this 1% is not too significant. Ensure IN and OUT probes are at the same temperature for 10 minutes. OUT is on the UMBILICAL cord; IN is at the control console. Turn the adjuster located to right of the thermometer

CLOCKWISE to DECREASE OUT reading; COUNTER-CLOCKWISE to INCREASE OUT.

## Changing the digital Thermometers to read Fahrenheit or Celsius



Figure 1  
The four 6/32 screws need to be removed so that you can get at the backside of the Thermometers.



Figure 2  
You will need to lay the Thermometers on their face to get at the backside.





Figure 3  
Out lined in red are the two places that will need to have solder added or removed.



Figure 4  
Just above the green cap 2A39 are two solder pads. The one that is circled is the one that is to be change.

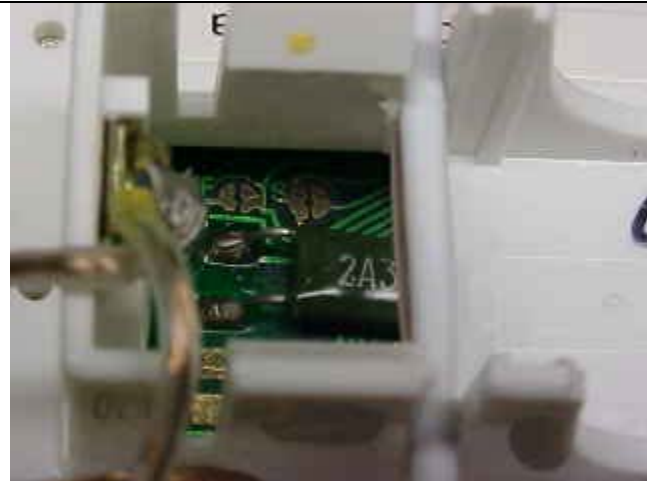


Figure 5  
Without solder on the left-hand pad the Thermometers read in Celsius



Figure 6  
With solder on the left-hand pad the Thermometers read in Fahrenheit



Figure 7  
Only hand tighten the 4 6/32 screws when reassembling the Thermometer plate into the console

## Possible Mechanical Problems

### Panels Will Not Fit Doorway

Try using an alternate doorway. If doorway is too large, use a 2" x 4" or a 2" x 3" block against the side of the panels, or panel width extenders to 48" (available from Retrotec). If the flow element rubs against the wall, door, or any other obstruction, try turning the panels upside down or contacting panels with another part of the door frame. If the doorway is less than 30" wide, try fitting the panels against a different part of the door-frame, or cut a plywood sheet to fit.

### Panels Fall Out of Doorway

If one panel is put into the doorway at moderate pressure, and then the second panel is put in with a lot of pressure, the doorway may stretch out and, thereby, loosen the first panel. The obvious solution is simply to re-tighten the first panel. Another solution is to put the upper panel in first and apply more pressure at the top than at the bottom. But be careful. If the expander mechanism has been over pressured, it may have to be replaced. Clean door frame.

### Weather-strip Wears

Peel off and replace in minutes for best doorway grip and appearance. To peel off the old material, simply catch an edge and roll it back.

### Gauge Needle Stuck

Needle rests against black post with gauge level - (must be level) 2 or 3 turns of the adjustment screw have been made but the needle won't move.

Cause - magnetic linkage on needle has jumped off.

Solution - suck hard on one of the red tubes and wait 20 seconds, if that doesn't work then blow on the tube. The needle should jump around then move back to zero.

Problem - when the zero adjustment screw is turned in or out (particularly out) all the way until increased resistance is felt, continued adjustment will destroy the gauge.

Still stuck? - adjust screw all the way in (clockwise) till resistance is felt, turn screw out 3 to 4 turns, if needle stays on post, repeat blowing technique.

Needle in mid-scale - (when level) and doesn't move or moves jerkily, look for needle touching faceplate. Gauge must be returned to Retrotec.

Needle in mid-scale - (when level) due to a crimp in the tubing. Blow gently in each end of the tube corresponding to the stuck gauge. If the gauge moves when blowing in one but not if blowing in the other than the latter tube is crimped.

Solution - move the tube bundle around in the control box until the crimp disappears.

### Gauges Do Not Read Properly or Stick

Ensure they are vertical and level. Check tubing to remove pinches, heavy feet, or other constrictions. Suck or blow HARD on open tube to unstick the needle. Remove any drops of moisture or spit in tube ends. Check

for leaks in the gauges by blowing in the tube, then folding the tube over on itself - the gauge should hold pressure without the needle dropping perceptibly.

Occasionally, a needle will get stuck to the face plate. Replacing the gauge is the only practical option.

#### Gauge Needle Falls When Tested

Each time the Infiltrometer is used, the gauges should be pressured up, the tube capped off to test for leaks. A sudden loss of pressure will indicate something has changed. Check, first to see if the translucent polyethylene quick connect is cracked or split. This is possible, so if unsure replace it. Heat the tube end if necessary. Next check all the exposed tube for cracks or cuts. Next, if on ROOM/ HOUSE PRESSURE 60 gauge, flip the switch and check in the other direction. This will show a leak on the other side of the gauge and will therefore require its removal. If all this fails, contact Retrotec.

#### Gauge Recalibration and Replacement

The Standard requires that the 0-60 Pa Room Pressure gauge be recalibrated on a yearly basis:

*"The room pressure gauge should be capable of measuring pressure differences from 0 Pa to at least 50 Pa. It should have an accuracy of  $\pm 1$  Pa and divisions of 2 Pa or less. Inclined oil-filled manometers are not considered to be traceable to a primary standard and need not be recalibrated. All other pressure measurement apparatus (e.g., electronic transducer or Magnehelic) should be calibrated at least yearly."*

NFPA does not specifically state that the 0-250 Pa Flow Pressure gauge(s) be recalibrated yearly, however you may wish to have the Flow Pressure gauge(s) recalibrated as well. If you don't have any problem getting good field calibration check results, you probably don't need to recheck your flow pressure gauges.

Retrotec offers a service to either calibrate your gauge in its control box, or to send you an exchange.

The complete system must be returned every five years for a complete calibration. For offshore customers this test may be waived by performing a field calibration check for the AHJ-but that will be up to him.

#### Blower Blade Rubs

Check to see if blade hits the screen or the edge of the white plastic tube. If it is hitting the screen, check to see if a screen bracket is off or twisted and adjust as necessary. If the screen is flat and appears to be properly located, the blade may have moved on the motor shaft. Unplug the blower, remove the rear screen, loosen the set screw holding the hub to the shaft, tap the hub back slightly towards the motor (ensuring it doesn't actually touch the motor), ensure the set screw is on the flat edge of the shaft, and re-tighten it. Re-attach the rear screen with cable ties.

If the blade is rubbing on the inside of the white plastic tube, check to see if the wire motor mounts are straight. If they have been bent, they can often be straightened out by hand. Otherwise, adjust the position of the motor by loosening two (2) motor mount bolts (180° opposed) and adding or removing white plastic washers. Keep the total number of washers used the same. If the white plastic is broken due to damage in shipping, contact us for advice.

#### Repairing Panel Cracks or Chip

Use ABS or crazy glue to repair. Paint with auto touch-up enamel.

#### Flex duct Maintenance and Repair

The flex duct will eventually wear out and need to be replaced. The duct itself can be ordered from Retrotec, you can then attach it to the old 2 x 2 panel. Small splits and tears should be taped over to ensure air from the room doesn't get pulled into it during the test, resulting in an inaccurate reading.

### Thermometer Replacement

If the thermometer does not read correctly and cannot be adjusted with the control on front of the console, the entire assembly is removable and can be replaced by the operator. Call Retrotec.

### Fan Makes Scraping Noise When Turning

Check to see if the blade hits the screen or the edge of the white plastic tube. Adjust the position of the motor by loosening two (2) bolts (180° opposed) and adding or removing washers. Keep the total number of washers used the same. Check to see if a screen bracket is loose. Re-attach.

### **Possible Electrical Problems**

#### Motor Does Not Turn

Check outlet. Ensure red rocker switch is on. Did motor overheat and trip its overload? If so, wait 20 minutes, but turn speed control down or off. Is blade free to turn? Check it with a pencil - if it does not glide, it may be rubbing or the blade may have moved forward on the shaft. If all is in order, the speed control may be defective. Plug the blower into a wall outlet with a standard extension cord. If it goes full speed, the controller is at fault.

#### Blower Speed Wanders

Small changes in voltage cause the blower speed to fluctuate up and down. Nothing is abnormal if this happens but watch HOUSE PRESSURE and FLOW PRESSURE gauge as they move together and obtain a set of readings simultaneously.

### **Cleaning**

#### Nylon Carrying Cases

Scotchguard the cases upon receipt to help them repel dirt and water. Vacuum off dust and avoid dragging them over dusty floors. Clean with upholstery cleaner.

#### Fiberglass Blower

Clean with fiberglass cleaner and wax yearly.

#### ABS Plastic Parts (9-hole, console, accessories)

- clean with mild spray soap.

**WARNING** - Locktite dissolves ABS so wipe up excess if used.

#### Panels

- clean with mild soap. Repair with epoxy.

### **Repairs, Warranty and Customer Support**

The Retrotec Infiltrometer is designed to be field serviceable. This makes repair faster and less expensive than returning to the manufacturer. Units sold in the US are repaired in Bellingham, WA. Canadian units are repaired in Vancouver, B.C. Contact Retrotec directly before shipping anything back.

#### Warranty



The Retrotec Infiltrrometer is warranted for two years parts and labor, except for the Hewlett Packard computer and Canon printer which are 90 days from the date of invoice.

#### First 30 Days

Retrotec will exchange components with major malfunctions (requiring factory repair) during the first 30 days from date of invoice. Retrotec will ship a new component to you by UPS ground.

#### Return

Phone the factory in Bellingham WA @ 360-738-9835 ext.303 (direct line to production) before returning anything for repair. Chances are it can be fixed in the field faster and more conveniently. Follow instructions given by Retrotec over the phone. If you are advised to return the defective component be sure to tape to it a complete written description of the problem and how it started with your return name and address and phone number. Use original packing material or equivalent.

#### **Customer Support**

Retrotec is committed to supporting its customers to ensure they get maximum use from the Infiltrrometer. We encourage you to call to discuss dealing with unusual situations, the interpretation of test results, air sealing techniques, and so on.

If you need an answer quickly and can't reach your local representative, call or fax the office listed below: Colin Genge, at the West Coast Office in Bellingham, WA at (360) 738-9835 ext. 308 or fax 647-7724. We are in the office from 9 to 6 p.m. Pacific Time. If Colin is not available try extension 301.

Retrotec offers classroom and on-site training. Please call for more information.

#### **Returning Items for Factory Service**

Our address is:

Retrotec Inc.  
2200 QUEEN ST., UNIT 12,  
BELLINGHAM, WA 98226  
U. S. A.

Make sure there is a note inside describing the exact problem and who to contact and where to return it.